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ABSTRACT

The 1971-72 Michigan Educational Assessment Program (MEAP) provided information on 22 measures of students and schools. While some of the data were gathered in routine Michigan Department of Education reports, mean socioeconomic status (SES) for each school and student performance data were gathered in a special endeavor during January 1972. The SES was estimated from information gathered in a questionnaire prepared by school principals. Students receiving regular classroom instruction in grades 4 and 7 were tested using a basic skills battery thereby providing student performance data. The battery consisted of four tests: Word Relationships, Reading, Mechanics of Written English, and Mathematics. For each of the four tests at each grade level, the raw score distribution was transformed into a standard score distribution with a mean of 50 and a standard deviation of 10. A majority of the achievement tests were somewhat difficult for students at both grade levels. However, the range of difficulty among items appears to be well represented. The tests possess acceptable to excellent ability to discriminate between good and poor students. (Author/DEP)

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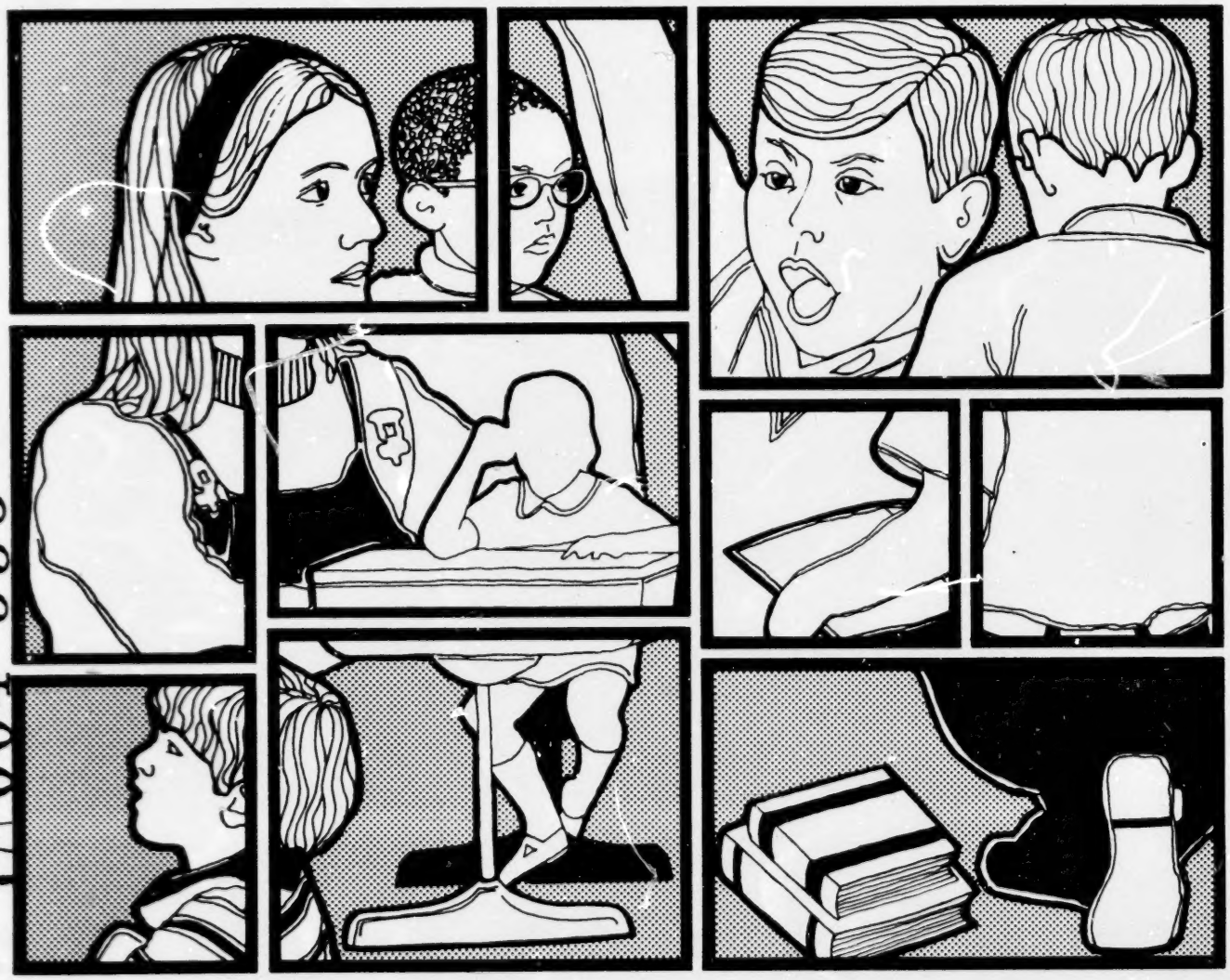
technical report

THE FIFTH REPORT OF THE 1971-72 MICHIGAN EDUCATIONAL ASSESSMENT PROGRAM

MICHIGAN DEPARTMENT OF EDUCATION NOVEMBER 1972



TM 004 555

TECHNICAL REPORT OF THE

1971-72 MICHIGAN EDUCATIONAL ASSESSMENT BATTERY

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Educational Testing Service

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INTRODUCTION

The Michigan Educational Assessment Program (MEAP) is designed to assess educational needs in the state. MEAP provides basic information about the educational attainments of fourth and seventh graders, and the allocation of resources for all Michigan school districts. A complete description of the Michigan Educational Assessment Program may be found in the publication entitled Objectives and Procedures*, which was the first report of the 1971-72 MEAP.

The primary function of this report is to provide the technical information needed to evaluate the instruments and techniques used in the 1971-72 educational assessment program. The report is intended primarily for people with some expertise in psychometrics, such as directors of research, research consultants, and school counselors.

* Objectives and Procedures of the Michigan Educational Assessment Program, 1971-72. 1971-72 Assessment Report No. 1, 1971, Lansing, Michigan, Michigan Department of Education.

THE 1971-72 MICHIGAN EDUCATIONAL ASSESSMENT PROGRAM

The 1971-72 Michigan Educational Assessment Program provided information on twenty-two measures of students and schools. A list of these measures is presented in Table 1. They can be classified into four major categories: student background measures; school resource measures; student and school performance measures; and, school and school district size. A complete definition of each measure is given in the Local District and School Report: Explanatory Materials*. This report provides technical information about the development and reporting of two types of measures: the composite estimate of socio-economic status and the basic skills measures.

In January, 1972, all students who were receiving regular classroom instruction in the content areas of reading, English, and mathematics at the fourth and seventh grade levels in the public schools of Michigan participated in the educational assessment program. Table 2 shows the number of districts, schools, and students from or about which information was obtained for the 1971-72 assessment program. The information in this table represents the maximum number of units from which the data were obtained. The numbers reported in Table 2 may vary from the numbers of schools and districts reported elsewhere, since data for some schools and districts were not available for every variable, and because schools and districts which tested fewer than five students, as well as all non K-12 districts, were not included in normative distributions and the computation of correlations.

* Local District and School Report: Explanatory Materials. Lansing Michigan; Michigan Department of Education; 1971-72 Assessment Report No. 2, 1972.

TABLE 1.

MEASURES AND SOURCES OF BASIC DATA*

MEASURES	SOURCE		
	District	School	Student
I. School Resources			
A. Human Resources			
(1) Professional Instructional Staff per 1,000 pupils		X	
(2) Teachers per 1,000 pupils		X	
(3) Average Years of Teaching Experience		X	
(4) Percent of Teachers with Masters Degree		X	
(5) Average Contracted Salary of Teachers		X	
B. Financial Resources			
(6) State Equalized Valuation per Resident Pupil (1970-71)	X		
(7) Local Revenue per Pupil (1970-71)	X		
(8) State School Aid per Pupil (1970-71)	X		
(9) K-12 Instructional Expense per Pupil (1970-71)	X		
(10) Elementary Instructional Expense per Pupil** (1970-71)	X		
(11) Total Current Operating Expense per Pupil (1970-71)	X		
II. Student Background			
(12) Percent of Racial-Ethnic Minority Students**		X	
(13) Composite Estimate of Socioeconomic Status		X	
III. School/Student Performance			
A. Basic Skills Measures			
(14) Word Relationships			X
(15) Reading			X
(16) Mechanics of Written English			X
(17) Mathematics			X
(18) Basic Skills Composite Achievement			X
B. Dropout Rate			
(19) School Dropout Rate (1970-71)	X		
IV. School or District Size			
(20) Total Membership**		X	
(21) Grade 4 Membership**		X	
(22) Grade 7 Membership**		X	

* Unless otherwise indicated, data for these measures were collected in 1971-72.
** These variables were added since the 1970-71 educational assessment program.

TABLE 2

NUMBERS OF DISTRICTS, SCHOOLS, AND STUDENTS
PARTICIPATING IN THE 1971-72 ASSESSMENT PROGRAM

Grade	No. of Districts	No. of Schools	No. of Students
4	608	2,485	162,280
7	581	917	164,601

SES SCALE AND REPORTED SCORE DEVELOPMENT

In the 1970-71 educational assessment program, the mean socio-economic status (SES) score for each school and district was calculated based on all responses to twenty-six questions in a background questionnaire. Due to the controversial nature of the background questionnaire, the questionnaire was not used in the 1971-72 assessment program. It was necessary, therefore, to find an alternative method to estimate the mean SES for each school and district.

Of particular concern was the great potential for change within schools due to the introduction of large scale busing programs and the possibility of changes in the definition of school attendance boundaries. It was assumed that most change in student assignments occurred between schools within a district and that minimal change occurred between districts. Therefore, it was decided to develop a procedure to estimate the school SES mean for 1971-72 and to use the 1970-71 district SES mean for reporting in 1971-72.

To estimate the 1971-72 school SES mean all of the available student and school variables as listed in Table 1 and the Principal Questionnaire (Appendix C) responses were used. The procedure was as follows:

1. Item 13 of the Principal Questionnaire asked the principal of each school to estimate how much change occurred, if any, in the average socio-economic status of the pupils between the 1970-71 and the 1971-72 school years. Those schools for which the principal indicated very little or no change were identified.

2. Using only schools for which the principals indicated very little or no change a multiple correlation was computed. The 1970-71 school SES mean (based upon student responses to the SES items) was the dependent variable. The independent variables were all of the 1971-72 student and school variables, including scores on the basic skills measures, and the 1971-72 Principal Questionnaire items. The variables selected and the regression weights assigned to them for grades 4 and 7, are shown in Tables 3 and 4 respectively on the following page.

3. The regression weights assigned to those variables which were selected in the multiple correlation computation were then used to estimate 1971-72 school SES. This was attempted for all schools in which the principal had indicated more than minor change in the average SES of the student population as well as for all schools where the principal had indicated no change or only minor change but no 1970-71 school SES was available.

4. If the principal's estimate of the change from 1970-71 to 1971-72 did not agree with the value calculated using this procedure (e.g., principal said SES was lower in 1971-72 than in 1970-71, but the calculated SES estimate was actually higher) then the 1970-71 estimate was used.

The SES value reported for the school was assigned a code to indicate whether or not an estimate was reported and how it was calculated. A summary of the codes used is provided in Table 5.

TABLE 3.

INDEPENDENT VARIABLES AND REGRESSION WEIGHTS
USED TO PREDICT SCHOOL SES, GRADE 4

INDEPENDENT VARIABLES	STANDARD REGRESSION WEIGHTS	REGRESSION WEIGHTS
Question 1	0.2247	1.9302
Word Relationships	0.0664	0.0781
Question 7	0.1917	1.0615
Question 6	0.1417	0.5234
Question 10	0.0643	0.2891
Questions 3-5	0.1470	0.5937
Percent Weight	0.0915	0.0191
Reading	0.1668	0.1978
Question 11	0.0666	0.2830

TABLE 4.

INDEPENDENT VARIABLES AND REGRESSION WEIGHTS
USED TO PREDICT SCHOOL SES, GRADE 7

INDEPENDENT VARIABLES	STANDARD REGRESSION WEIGHTS	REGRESSION WEIGHTS
Word Relationships	0.4451	0.4752
Question 1	0.2063	1.7611
Question 7	0.1309	0.6226
Question 10	0.0981	0.2910
Questions 3-5	0.1532	0.5983
Average Salary	-0.1398	-0.3450
Question 12	0.0545	0.2033
Question 8	0.0443	0.4353
Question 6	0.0688	0.2134
Average Experience	0.0481	0.0526

TABLE 5

CODING SYSTEM FOR REPORTING SCHOOL BUILDING SES SCORES

Code	Explanation
1	The principal indicated no change in SES from 1970-71 to 1971-72. The reported figure is the 1970-71 value.
2	The principal indicated no change in SES, but there was no 1970-71 value available. The reported figure is a new SES estimation.
3	The 1970-71 score was not available nor was there enough data to estimate a new figure. The principal had indicated no change in SES levels. No building SES figure is recorded.
4	The reported figure is a new SES estimation based upon the principal's indication that a change had occurred in SES level. The regression weights were applied to the appropriate 1971-72 variables to calculate a new SES index.
5	The principal indicated a change had occurred but there was insufficient data to compute a new value.
6	The 1970-71 score was not available nor was there enough data to estimate a new figure. The principal had indicated a change in SES levels. No building SES figure is recorded.
7	The principal's 1971-72 questionnaire was not available. The reported figure is the 1970-71 value.
8	There were no 1970-71 data and no 1971-72 principal's questionnaire. No building SES figure is recorded.
9	The principal indicated an increase in SES level but the new calculation of SES was equal to or lower than the 1970-71 value.
10	The principal indicated a decrease in SES level but the new calculation of SES was equal to or higher than the 1970-71 value. The reported figure is the 1970-71 value.
11	The reported figure is a weighted average of a fourth and a seventh grade SES score derived by any combination of codes 1, 2, 4, 5, 7, 9 and 10.
12.	The reported figure is the SES score available from either the fourth or seventh grade of a school containing both grades but for which only one grade level SES score was available from codes 1, 2, 4, 5, 7, 9 or 10.

TESTS OF BASIC SKILLS

The 1971-72 tests of basic skills consisted of four tests: Word Relationships, and achievement tests in Reading, Mechanics of Written English, and Mathematics. Like its predecessors, the battery was developed according to specifications proposed by Educational Testing Service which were reviewed and approved by the Michigan Department of Education.

Both the specifications and the tests were reviewed by six different test committees. Revisions were made in both the tests and specifications, not only for the 1971-72 tests, but for the 1972-73 tests as well. The following is a description of the process used to review and revise the specifications and the tests.

Development and Review of Items

In February, 1971, members of the Michigan Department of Education began to explore ways of getting Michigan teachers and administrators more involved in the test development process of the Michigan Educational Assessment Program. They were particularly interested in the formation of committees which would enable them to bring the ideas, knowledge, and experience of Michigan educators to bear on the problem of making the Michigan Assessment of Basic Skills a more appropriate test for Michigan students.

In June the Department solicited nominations for committee membership by contacting the appropriate Michigan education associations. From the nominees, the Department formed six test committees -- one for each

of three subject matter areas (English, reading, and mathematics) at each of two grade levels (fourth and seventh). Each committee was composed of seven members -- in general an administrator, two subject matter specialists, and four classroom teachers with a strong background in the subject matter. The members of each committee are given in Appendix D.

The committees participated in workshops that included representatives from the Department and test specialists from Educational Testing Service. In the course of the workshops, content specifications were reviewed and revised and equating items were selected from form TMT (administered January, 1971) to be used in form UMT (administered January, 1972). The number of items in the Word Relationship test for fourth grade was reduced from 50 to 45. The specifications for the seventh grade Mechanics of Written English test were revised to eliminate Part C, Written Usage.

The test development specialists from Educational Testing Service provided information about item statistics and guidance in the techniques of reviewing and writing test items. The committee members spent considerable time writing, reviewing, and discussing new materials, which were pretested in the 1972 administration and, where appropriate, will be used in the 1972-73 assessment program. Members of each committee wrote additional items after the workshop and submitted them to Educational Testing Service. At Educational Testing Service, a test specialist in each subject-matter area reviewed and revised all the committee-written items. Some of the considerations borne in mind in reviewing the test items were:

(1) Does the item have one and only one correct answer?

(2) Is the language simple, direct, and free of ambiguity? Is it appropriate for the intended test population?

(3) Is the item difficult because it requires sophisticated reasoning, or only because it tests obscure or esoteric subject matter?

(4) Does the item test a concept that is in the domain of the content specifications?

(5) Is the content of the item not "biased" or "offensive" to any segment of the population?

Items that could not be revised to satisfy each of these five criteria were discarded and the items in the reduced item pool were classified according to content category. At this stage the better items in each category were assembled into pretests. For those categories where there was a shortage of items written by the committees, additional items were written by the ETS test specialists. Table 6 shows the number of tests for each subject that were pretested.

TABLE 6

THE NUMBER OF PRETESTS ADMINISTERED PER SUBJECT AREA AND GRADE

Subject	Number of Pretests	
	Grade 4	Grade 7
Vocabulary	2	2
Reading Comprehension	4	4
English	2	2
Mathematics	3	4
*Music	1	0

* The items in the music pretest were written by a committee of music educators representing the Michigan Music Education Association, directed by Dr. Robert Syndell of Michigan State University and were reviewed by the staff at Educational Testing Service.

After the pretests were assembled they were reviewed independently by two other test specialists. In addition to the concerns of the item reviewer, the test reviewer was concerned with such questions as:

(1) Do the items cover a sufficient range of difficulty?

(2) Are the items ordered from easy to hard?

(3) Does each item extend the content domain? Are there items in all the categories in the content specification?

(4) Is each item independent of all other items?

(5) Is the test as a whole free from bias in favor of some segment Of the population?

The pretests were then reviewed by the editorial staff for clarity of language and consistency of style.

The pretests were administered, along with the 1971-72 tests of basic skills, to fourth and seventh graders in the State. Because it was necessary to read the directions for the pretests aloud, the pretests were randomly assigned to districts (in Detroit, they were randomly assigned to schools), so that no district (except Detroit) administered more than one of the twelve pretests at each grade level. The results of these pretests will be used to prepare the tests of basic skills for the 1972-73 assessment.

Description of the Tests of Basic Skills

The achievement portion of the assessment battery contained individually timed tests in Word Relationships, Reading, Mechanics of Written English, and Mathematics. Different forms of the tests were administered at the two grade levels, but they all consisted of four-option multiple choice questions. The tests are described briefly in the following

paragraphs. Table 7 shows the number of items and the time limits for each section and sub-section of the tests for each grade level. Content specifications and item classifications for each test will be found in Appendix B.

The Word Relationships test was designed to measure students' knowledge of the meaning of words and the relationships between words and concepts.

The Reading test assessed paragraph comprehension, ability to understand words from the context in which they are encountered, and ability to identify the correct synonym for a word.

The Mechanics of Written English test for the fourth grade consisted of four parts; part A, Spelling, asked students to identify misspelled words; part B, Effectiveness of Written Expression, required students to select the best way of expressing a thought; part C, Written Usage, asked students to recognize grammatical errors; and part D, Punctuation and Capitalization, asked students to recognize errors of punctuation and capitalization. The Mechanics of Written English test for the seventh grade consisted of three of these parts, excluding Written Usage.

The Mathematics test involved mathematical reasoning and problem solving. In addition, problems in the seventh grade test involved algebraic and geometric concepts.

TABLE 7

NUMBERS OF QUESTIONS AND TIME LIMITS FOR EACH SEPARATELY-TIMED PART OF THE ASSESSMENT BATTERY (BY GRADE)

	Grade 4		Grade 7	
	Questions	Time	Questions	Time
Word Relationships	45	20	50	20
Reading	50	35	50	35
Mechanics of Written English				
A. Spelling	15	5	20	6
B. Effectiveness of Written Expression	14	9	20	13
C. Written Usage	14	8		
D. Punctuation and Capitalization (Part C for Grade 7)	12	8	20	11
(Total Mechanics of Written English)	(55)	(30)	(60)	(30)
Mathematics	40	30	40	30

Scale and Reported Score Development

The raw score on each of the tests of basic skills is the number of questions the student answered correctly. For each of the four tests at each grade level, the raw score distribution was transformed into a standard score distribution with a mean of 50 and a standard deviation of 10. After these transformations, a Composite Achievement score was computed for each student. It consisted of the average of his standard scores on Reading, Mechanics of Written English, and Mathematics. Appendix A presents the raw and standard score distributions, the conversion parameters, and the percentile ranks for each test at each grade level. It also gives the standard score distribution and the percentile ranks for the Composite Achievement scores at each grade level.

Five standard scores were reported for each student: Word Relationships, Reading, Mechanics of Written English, Mathematics, and Composite Achievement.

Psychometric Properties of the Tests of Basic Skills

At each of the grade levels, 4 and 7, a spaced sample of approximately 1,000 answer sheets was drawn from the answer sheets of all the students who participated in the program. These answer sheets provided the data for determining the psychometric properties of the four achievement tests: Word Relationships, Reading, Mechanics of Written English, and Mathematics, and where appropriate, for the Composite Achievement score. Table 8 shows the summary statistics for these tests for both samples and for both total groups. Inspection of that table indicates

that the fourth grade sample is slightly less able than the fourth grade total group; all the sample means are a little lower than the total group means. Inasmuch as no difference is as large as one raw score point and the standard deviations are in close agreement, the differences are judged to be of little practical significance to the analyses. There are no noteworthy or consistent differences between the seventh grade sample and the seventh grade total group.

TABLE 8

SUMMARY STATISTICS* ON ACHIEVEMENT TESTS FOR SAMPLE AND TOTAL POPULATIONS

	Grade 4				Grade 7			
	Sample		Total		Sample		Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Word Relationships	25.15	9.21	25.73	9.33	29.49	8.72	29.33	8.77
Reading	30.69	10.91	31.02	10.88	34.17	10.00	33.90	10.02
Mechanics of Written English	30.89	10.82	31.07	10.65	35.36	10.31	35.06	10.53
Mathematics	22.94	7.35	22.96	7.27	23.86	8.03	23.81	8.06

The properties of the tests are discussed in the following paragraphs. Tables 9 and 10 present the intercorrelations among the tests at grades 4 and 7 respectively, and Table 11 presents data on reliability, speededness, difficulty, and discrimination.

Validity: The content validity of the achievement tests, which is

* In raw score units

TABLE 9.

INTERCORRELATIONS AMONG ACHIEVEMENT TESTS - GRADE 4

	READ-ING	MECHANICS OF WRITTEN ENGLISH					MATH
		TOTAL	A	B	C	D	
Word Relationships	.79	.62	.65	.65	.67	.62	.77
Reading		.84	.70	.74	.71	.67	.76
English: Total							.77
Section A: Spelling				.58	.61	.60	.61
Section B: Effective Expression					.62	.58	.65
Section C: Usage						.60	.65
Section D: Punctuation, Capitalization							.66

TABLE 10.

INTERCORRELATIONS AMONG ACHIEVEMENT TESTS - GRADE 7

	READ-ING	MECHANICS OF WRITTEN ENGLISH				MATH
		TOTAL	A	B	C	
Word Relationships	.80	.73	.58	.68	.61	.76
Reading		.80	.66	.75	.65	.75
English: Total						.75
Section A: Spelling				.59	.59	.58
Section B: Effective Expression					.61	.68
Section C: Punctuation, Capitalization						.67

TABLE 11. STATISTICAL PROPERTIES OF ACHIEVEMENT TESTS BY GRADE

	Reliability[1]		Standard[2] Error of Measurement		Speededness				Difficulty[3]		Discrimination[4]	
					Gr. 4		Gr. 7					
	Gr. 4	Gr. 7	Gr. 4	Gr. 7	% completing	% reaching 3/4 point	% completing	% reaching 3/4 point	Gr. 4 %	Gr. 7 %	Gr. 4	Gr. 7
Word Relationships	.91	.89	2.8	2.9	68.6	87.2	82.4	96.0	55.9	59.0	.52	.50
Reading	.93	.92	2.9	2.8	82.1	95.8	93.9	98.0	61.4	68.3	.60	.60
Written English	.92*	.90*	3.1	3.3	NA	NA	NA	NA	56.2	58.9	.51	.49
A Spelling	.77	.79	**	**	90.0	95.6	94.2	98.8	57.8	55.9	.51	.50
B Effective Expression	.81	.82	**	**	86.2	95.0	96.3	98.7	60.3	70.0	.56	.55
C Usage	.74	--	**	--	91.2	95.6	--	--	--	--	--	--
D Punctuation, Capitalization	.71	.72	**	**	91.4	95.8	94.9	97.8	55.8	51.0	.49	.42
Mathematics	.87	.87	3.7	2.6	85.9	96.4	89.5	96.5	57.3	59.7	.52	.55
Composite Achievement	.96*	.96*	1.79	1.77	NA	NA	NA	NA	NA	NA	NA	NA

1. Kudar-Richardson (20), *See text

2. In standard score units

3. Mean as a percentage of number of items

4. Mean item-total r_{bis}

**These statistics were not computed since scores on the sub-tests were not reported.

of utmost importance, can be judged by the procedures used in their development and by inspection of the classification of the test questions into various segments of the content domain. The development of these tests has been described in an earlier section of this report, and test specifications and classification of test items are presented in Appendix B. Examination of these sources of information indicates that the tests have high content validity.

The extent to which the tests measure different achievement may be judged by the size of the correlation co-efficients reported in Tables 9 and 10. In those tables the inter-correlations among the separately-timed tests and the reliabilities of the tests at the fourth grade level and at the seventh grade level are shown. The correlations of the scores on the separately-timed sections of the Mechanics of Written English Test with the total Mechanics of Written English score are not reported since these correlations are spuriously high because each sub-test contributes to the total score.

The extent to which each sub-test makes a unique contribution to the achievements being measured may be judged by considering the differences between the correlation of the sub-test with other sub-tests and the reliability of both sub-tests. If the correlation is lower than either reliability then each sub-test is contributing independently to the measurement. If the correlation is equal to or greater than either reliability then little, if any unique measurement is being contributed by using both measures. For example, Table 9 shows the correlation between part A and part B of the 4th grade test to be .58. The reliabilities of these two parts are .77 and .81 respectively. Since the correlation of .58 is considerably below either

reliability, .77 and .81, it is clear that each sub-test is making a unique contribution to the total score.

Reliability: The reliability estimates reported in Table 11 are measures of internal consistency based on a single administration. As such, they indicate the extent to which the items that make up the test measure the same thing.

The reliability estimates for the separately-timed parts were computed using the Kuder Richardson formula 20; those for the Mechanics of Written English total score and for the Composite Achievement score were computed using this formula:

$$\text{Reliability} = 1 - \frac{\sum w^2 \, SE_{meas}^2}{\sigma_t^2}$$

For the Mechanics of Written English total score, the weights, w were each unity; the standard errors of measurement were those of the four sub-sections; and σ_t^2 was the variance of the total score. For the Composite Achievement score, the weights were the appropriate A values in the conversion equations (see Conversion Data, Appendix A), the standard errors of measurement were those for the three tests (Reading, Mechanics of Written English, and Mathematics), and σ_t^2 was the composite score variance.

As can be seen from Table 11, the reliability estimates reported for the sub-tests of the Mechanics of Written English Test range from .71 to .82 indicating that these brief sub-tests are not reliable enough for the assessment of individual students. The estimates reported for the four achievement tests and the composite score, however, range from

.87 to .96 indicating that these tests and the composite score are sufficiently reliable* for that purpose.

The standard errors of measurement, which are indices of the reliability of individual test scores, reported in Table 11, are sufficiently low to justify the use of these four tests and of the Composite Achievement score in the assessment of individual students.

Speededness: A test is usually judged to be unspeeded if virtually all of the students reach a point three quarters of the way through the test and eighty percent of the students reach the last question. Inspection of the speededness data in Table 11 indicates that the Word Relationship Test was speeded at the fourth grade level. That test at the seventh grade level and the remaining tests at both grade levels were not unduly speeded. While not everyone reached the three quarter point in any test, in each instance more than eighty percent reached the last question.

Difficulty: The data reported for this property of the tests is the average number of items answered correctly by the sample, expressed as a percentage of the number of items in the test. A test of middle average difficulty is preferable for maximum reliability. In a test consisting of questions with four alternative answers, middle or average difficulty would be represented by 62.5%. This figure is based on the

* Remmers, H. H. and Gage, N. L. Educational Measurement and Evaluation, Revised Edition 1955, Harper and Brothers, New York, pp. 140-141.

assumption that "average" students would know the answers to half of the questions and get a quarter of the remaining questions right by guessing.

Inspection of the percentage indicators of difficulty in Table 11 reveals that the majority of the achievement tests, including the sub-tests of Mechanics of Written English, were somewhat difficult for the students at both grade levels. At grade 4, the English Usage sub-test and at grade 7, the Punctuation and Capitalization sub-test could clearly be labeled difficult. The Reading test and the Effectiveness of Written English test were of average difficulty for grade 4 and somewhat easy for grade 7.

Additional information about the difficulty of the fourth grade tests is summarized on page A-11 in Appendix A. At the top of this page are frequency distributions of the difficulty index, delta. A four-choice item that is known by one-half of the group and answered at random by the remainder would be expected to yeild a delta of about 11.7*. The observed mean for Word Relationships exceeds this middle-difficulty reference value by one half a delta point; Mechanics of Written English is more difficult by an average of 0.6 delta point; and the Mathematics mean delta is 0.4 above middle-difficulty.

More important, perhaps, than the average difficulty is the spread of difficulty among the items. When the group to be tested represents

* A fuller description of the difficulty index, delta, may be found on page 140 of Thorndike, Robert L. (ed.), Educational Measurement Second Edition: Washington: American Council on Education, 1971.

a broad range of ability, and when discrimination at both extremes of the ability range is required, then it is necessary that the items cover a very wide difficulty range, for items of middle difficulty for the group as a whole may be altogether too easy for one extreme group or too hard for the other. Here, the upper portion of the item difficulty range appears to be well represented, but there are few items with deltas in the range of 6.0 to 9.0 in most of the tests. The inclusion of even a few items within this range in each test would materially reduce the proportions of scores that fall in the chance area. It should perhaps be noted here that, since the sample is a little less able than the total group, the deltas are slight overestimates, but no mean discrepancy is likely to exceed 0.2 delta point.

Item statistics for the seventh grade tests are summarized on page A-12 of Appendix A. At the top of the page are frequency distributions of the difficulty index, delta. The observed means for the four seventh grade tests lie within 11.6 and 12.7, and three are somewhat higher than the middle-difficulty reference value. Here, the upper portion of the item difficulty range appears to be fairly well represented, but a few additional items with deltas in the range of 6.0 to 9.0 in those parts with high proportions of scores in the chance area would result in fewer such scores.

Discrimination. An indication of the extent to which each test or sub-test discriminates between good and poor students can be found in the last two columns of Table 11. In each instance the index of discrimination reported there is the mean biserial correlation between scores on the entire test and dichotomized (right vs. wrong) item responses. The mean correlation range from .42 for the Punctuation and Capitalization sub-test

at the seventh grade to .60 for Reading at both grades, indicates that the tests and sub-tests possess acceptable to excellent ability to discriminate between good and poor students.

At the bottom of page A-11 are distributions of the biserial correlations between item scores and criterion scores for the fourth grade tests. The criterion for the items in the Mechanics of Written English part scores is the 55 item total score. Otherwise, the criterion for each set is the score on the test noted at the top of the same column. Mean values range from .48 for the English Usage sub-test to .60 for Reading.

At the bottem of page A-12 are distributions of the biserial correlations between item scores and criterion scores for the seventh grade tests. The criterion for the items in the Mechanics of Written English part scores is the 60-item total score. Otherwise, the criterion for each set is the score on the test noted at the top of the same column. Mean values range from .42 for the Punctuation and Capitalization sub-test to .60 for Reading.

SUMMARY

The 1971-72 Michigan Educational Assessment Program (MEAP) provided information on twenty-two measures of students and schools. While some of the data were gathered in routine Michigan Department of Education reports, mean socio-economic status (SES) for each school and student performance data were gathered in a special endeavor during January, 1972.

The SES was estimated from information gathered in a questionnaire prepared by school principals. Students receiving regular classroom instruction

in grades 4 and 7 were tested using a basic skills battery thereby providing student performance data. The Battery consisted of four tests: Word Relationships, Reading, Mechanics of Written English, and Mathematics. For each of the four tests at each grade level, the raw score distribution was transformed into a standard score distribution with a mean of 50 and a standard deviation of 10.

Committees of Michigan educators assisted in the development and review of items. In so doing and because of the representativeness of the content domain, the tests can be judged as having high content validity. The tests measure different achievement areas due to the size of the intercorrelations among the separately-timed tests and the test reliabilities.

While some of the reliability estimates of the brief sub-tests are not high enough for the assessment of individual students, the estimates for the four tests and the composite scores are sufficiently high for that purpose. All of the tests except Word Relationships at the fourth grade level were not unduly speeded.

A majority of the achievement tests were somewhat difficult for students at both grade levels. However, the range of difficulty among items appears to be well represented. The tests possess acceptable to excellent ability to discriminate between good and poor students.

APPENDIX A

Tests of Basic Skills
Raw and Standard Score Distributions,
Conversion Parameters, and Percentile Ranks

Test Analysis of Form UMT

Grade 4

Word Relationships

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
45	71	307	99.8
42-44	67-70	4958	96.7
39-41	64-66	10530	90.1
36-38	61-63	13272	81.9
33-35	58-60	14437	72.8
30-32	55-57	15307	63.3
27-29	51-54	16152	53.2
24-26	48-50	17495	42.3
21-23	45-47	17362	31.5
18-20	42-44	16330	21.3
15-17	39-41	13337	12.9
12-14	35-37	10252	6.5
9-11	32-34	6265	2.6
6- 8	29-31	2952	0.8
3- 5	26-28	1076	0.1
0- 2	22-25	202	0.0
		160234	

M_x = raw score mean — $M_x = 25.73$

σ_x = standard raw scores — $\sigma_x = 9.33$

M_y = standard score mean — $M_y = 50.0$

σ_y = standard deviation of standard scores — $\sigma_y = 10.0$

Md_x = median of raw scores — $Md_x = 25.61$ (45 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$$Y = \underset{B}{22.4382} + \underset{A}{1.0714}$$

Test Analysis of Form UMT

Grade 4

Reading

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
48-50	66-67	2987	98.1
45-47	63-65	11741	90.8
42-44	60-62	17141	80.1
39-41	57-59	17998	68.9
36-38	55-56	16865	58.4
33-35	52-54	14889	49.1
30-32	49-51	13014	40.9
27-29	46-48	11489	33.8
24-26	44-45	10113	27.5
21-23	41-43	9599	21.5
18-20	38-40	9603	15.5
15-17	35-37	9930	9.3
12-14	33-34	8392	4.0
9-11	30-32	4469	1.3
6-8	27-29	1487	0.3
3-5	24-26	427	0.1
0-2	21-23	91	0.0
		160235	

$M_x = 31.02$

$\sigma_x = 10.88$

$M_y = 50.0$

$\sigma_y = 10.0$

$Md_x = 32.81$

(50 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

B A

$Y = 21.4922 + 0.9190$

Test Analysis of Form UMT

Grade 4

Mechanics of Written English

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
54-55	72-72	319	99.8
51-53	69-71	2607	98.2
48-50	66-68	5902	94.5
45-47	63-65	9572	88.5
42-44	60-62	12282	80.8
39-41	57-59	14148	72.0
36-38	55-57	14789	62.8
33-35	52-54	15007	53.4
30-32	49-51	14515	44.3
27-29	46-48	14200	35.5
24-26	43-45	13661	26.9
21-23	41-42	12626	19.0
18-20	38-40	11392	11.9
15-17	35-37	9056	6.3
12-14	32-34	5878	2.6
9-11	29-31	2857	0.8
6-8	26-28	944	0.2
3-5	24-26	278	0.04
0-2	21-23	72	0.00
		160105	

$M_x = 31.07$

$\sigma_x = 10.65$

$M_y = 50.0 \quad 50.$

$\sigma_y = 10.0$

$Md_x = 31.39$

(55 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$$Y = \underset{B}{20.8269} + \underset{A}{0.9388}$$

Test Analysis of Form UMT

Grade 4

Mathematics

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
40	73	94	99.9
38-39	71-72	1039	99.3
36-37	68-69	3190	97.3
34-35	65-67	6594	93.2
32-33	62-64	9965	86.9
30-31	60-61	12620	79.0
28-29	57-58	14368	70.1
26-27	54-56	15103	60.6
24-25	51-53	15218	51.1
22-23	49-50	14773	41.9
20-21	46-47	14186	33.0
18-19	43-45	13126	24.8
16-17	40-42	11698	17.5
14-15	38-39	9929	11.2
12-13	35-36	7677	6.4
10-11	32-34	5320	3.1
8-9	29-31	2986	1.2
6-7	27-28	1309	0.4
4-5	24-25	490	0.1
2-3	21-23	142	0.03
0-1	18-20	48	0.00
		159875	

$M_x = 22.96$

$\sigma_x = 7.27$

$M_y = 50.0$

$\sigma_y = 10.0$

$Md_x = 23.27$

(40 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$Y = 18.4062 + 1.3762$ (B A)

Test Analysis of Form UMT

Grade 4

Composite Achievement

Standard Score Y	f	Percentile Rank of Lower Limit of Interval
69-71	401	99.7
66-68	3559	97.5
63-65	9413	91.6
60-62	14582	82.4
57-59	17676	71.3
54-56	18569	59.6
51-53	16879	49.0
48-50	15665	39.2
45-47	14601	30.0
42-44	13221	21.7
39-41	12603	13.7
36-38	10870	6.9
33-35	7396	2.2
30-32	2852	0.5
27-29	551	0.1
24-26	157	0.01
21-23	11	0.00
	159006	

Conversion Data

Average of Reading, Mechanics of Written English, and Mathematics scaled scores.

$M_y = 50.0$

$\sigma_y = 9.3$

$Md_y = 50.8$

Test Analyses of Form UMT

Grade 7

Word Relationships

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
48-50	71-74	472	99.7
45-47	68-70	3490	97.6
42-44	64-67	8806	92.1
39-41	61-63	13921	83.6
36-38	58-60	17930	72.5
33-35	54-56	19327	60.6
30-32	51-53	19261	48.7
27-29	47-50	18198	37.5
24-26	44-46	16389	27.4
21-23	41-43	14878	18.2
18-20	37-39	12791	10.3
15-17	34-36	8926	4.8
12-14	30-33	4848	1.9
9-11	27-29	2104	0.6
6-8	23-26	665	0.2
3-5	20-22	202	0.03
0-2	17-19	46	0.00
		162254	

$M_x = 29.33$

$\sigma_x = 8.77$

$M_y = 50.0$

$\sigma_y = 10.0$

$Md_x = 29.83$

(50 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$$Y = 16.5435 + 1.1408$$

B A

Test Analyses of Form UMT

Grade 7

Reading

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
48-50	64-66	8930	94.5
45-47	61-63	16832	84.1
42-44	58-60	19090	72.4
39-41	55-57	18543	60.9
36-38	52-54	17135	50.4
33-35	49-51	15446	40.9
30-32	46-48	13804	32.3
27-29	43-45	12369	24.7
24-26	40-42	10848	18.0
21-23	37-39	9247	12.3
18-20	34-36	7931	7.5
15-17	31-33	6061	3.7
12-14	28-30	3938	1.3
9-11	25-27	1588	0.3
6-8	22-24	416	0.1
3-5	19-21	78	0.01
0-2	16-18	19	0.00
		162275	

$M_x = 33.90$

$\sigma_x = 10.02$

$M_y = 49.9$

$\sigma_y = 10.0$

$Md_x = 35.39$

(50 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$Y = 16.1629 + 0.9981$ (R, A)

Test Analyses of Form UMT

Grade 7

Mechanics of Written English

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
60	74	39	99.98
57-59	71-73	853	99.5
54-56	68-70	2932	97.6
51-53	65-67	6182	93.8
48-50	62-64	9705	87.9
45-47	59-61	13214	79.7
42-44	57-58	15800	70.0
39-41	54-56	17259	59.3
36-38	51-53	17194	48.8
33-35	48-50	15930	38.9
30-32	45-47	14366	30.1
27-29	42-44	12323	22.5
24-26	39-41	10603	16.0
21-23	37-39	8876	10.5
18-20	34-36	7365	6.0
15-17	31-33	5236	2.7
12-14	28-30	2890	1.0
9-11	25-27	1091	0.3
6-8	22-24	320	0.1
3-5	20-21	95	0.02
0-2	17-19	37	0.00
		162310	

$M_x = 35.06$

$\sigma_x = 10.53$

$M_y = 50.0$

$\sigma_y = 10.0$

$Md_x = 35.85$

(60 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

$Y = 16.7063 + 0.9496$ (B, A)

Test Analyses of Form UMT

Grade 7

Mathematics

Raw Score X	Standard Score Y	f	Percentile Rank of Lower Limit of Interval
40	70	287	99.8
38-39	68-69	3456	97.7
36-37	65-66	7957	92.8
34-35	63-64	10712	86.2
32-33	60-61	11614	79.0
30-31	58-59	12308	71.4
28-29	55-56	12440	63.7
26-27	53-54	12590	55.9
24-25	50-51	12742	48.1
22-23	48-49	12311	40.5
20-21	45-47	12352	32.8
18-19	43-44	12096	25.4
16-17	40-42	11379	18.4
14-15	38-39	10333	12.0
12-13	35-37	8521	6.7
10-11	33-34	6043	3.0
8-9	30-32	3193	1.0
6-7	28-29	1193	0.3
4-5	25-27	339	0.1
2-3	23-24	81	0.01
0-1	20-22	22	0.00
		161969	

$M_x = 23.81$

$\sigma_x = 8.06$

$M_y = 50.0$

$\sigma_y = 10.0$

$Md_x = 23.99$

(40 items)

Conversion Data

Raw scores converted to scale with mean of 50 and standard deviation of 10 for this group.

B A

$Y = 20.4765 + 1.2402$

Test Analyses of Form UMT

Grade 7

Composite Achievement

Standard Score Y	f	Percentile Rank of Lower Limit of Interval
69-71	125	99.9
66-68	3039	98.0
63-65	9173	92.3
60-62	15041	83.0
57-59	17786	71.9
54-56	19034	60.1
51-53	18190	48.8
48-50	16858	38.3
45-47	15074	28.9
42-44	13471	20.6
39-41	11791	13.2
36-38	9648	7.2
33-35	7037	2.9
30-32	3640	0.6
27-29	856	0.1
24-26	98	0.01
21-23	15	0.00
	160876	

Conversion Data

Average of Reading, Mechanics of Written English and Mathematics scaled scores.

$M_y = 50.0$

$\sigma_y = 9.1$

$Md_y = 50.8$

Form UMT Grade 4

Frequency Distributions of Original Deltas
and Biserial Correlations, by Sections

Delta	Word Relationships	Reading	Mechanics of Written English					Math
			A	B	C	D	Total	
19.0 up								
18.0-18.9								
17.0-17.9								1
16.0-16.9	1				1	-	1	2
15.0-15.9		3	1		-	1	2	2
14.0-14.9	7	2	2		3	1	6	3
13.0-13.9	14	9	3	3	3	4	13	5
12.0-12.9	2	8	2	4	3	2	11	11
11.0-11.9	10	9	3	5	1	-	9	5
10.0-10.9	4	7	1		3	3	7	2
9.0- 9.9	5	9	2	2		1	5	5
8.0- 8.9	1	2	1				1	2
7.0- 7.9	1	1						2
Total items	45	50	15	14	14	12	55	40
Mean delta	12.2	11.7	12.1	11.8	12.9	12.4	12.3	12.1
σ	1.9	1.9	1.9	1.2	1.7	1.7	1.7	2.4

r_{bis}								
.90-.99								
.80-.89		3						
.70-.79		13						3
.60-.69	7	15	4	6	2		12	11
.50-.59	18	11	6	6	5	6	23	15
.40-.49	16	3	3	1	4	5	13	5
.30-.39	4	2	2	1	1		4	2
.20-.29		3			2	1	3	3
.10-.19								1
Total items	45	50	15	14	14	12	55	40
Mean delta	.52	.60	.51	.56	.48	.49	.51	.52
σ	.09	.14	.10	.07	.13	.07	.10	.14

Frequency Distributions of Original Deltas
and Biserial Correlations, by Sections

	Word Relationships	Reading	Mechanics of Written English				Math
			A	B	C	Total	
19.0 up..							
18.0-18.9							
17.0-17.9							
16.0-16.9	2		2		1	3	1
15.0-15.9	3		1			1	3
14.0-14.9	6	2	1	1	6	8	1
13.0-13.9	7	4	3	2	1	6	6
12.0-12.9	8	9	5	2	7	14	7
11.0-11.9	7	9	3	4	3	10	8
10.0-10.9	7	11	1	3	1	5	7
9.0- 9.9	3	9	2	5	1	8	4
8.0- 8.9	5	1	1	3		4	2
7.0- 7.9	2	3	1			1	1
6.0- 6.9		2	2				
Total items	50	50	20	20	20	60	40
Mean delta	11.9	10.9	12.3	10.7	12.9	12.0	11.9
σ	2.4	1.9	2.3	1.7	1.4	2.1	2.0
r_{bis}							
.90-.99							
.80-.89		1					
.70-.79	4	9		1		1	
.60-.69-	6	17	6	5	1	12	15
.50-.59	16	12	5	9	4	18	15
.40-.49	13	8	5	3	6	14	7
.30-.39	9	2	3	1	8	12	1
.20-.29	2		1	1	1	3	2
Total items	50	49	20	20	20	60	40
Not complete		1					
Mean delta	.50	.60	.50	.55	.42	.49	.55
σ	.13	.11	.12	.11	.09	.12	.10

APPENDIX B

Basic Skills Test Question Classifications and Content Specifications

Michigan Assessment - Word Relationships - Form UMT

Grade 4

	Subject	Relationship
1.	Geography	Characteristic of
2.	Household	Associated with
3.	Aesthetic	Cause-Effect
4.	Sports	Part-Whole
5.	Aesthetic	Object-Action
6.	Abstract	Antonyms
7.	Geography	Associated with
8.	Animals	Characteristic of
9.	Tools	Associated with
10.	Sports	Associated with
11.	Abstract	Antonyms
12.	Animals	Part-Whole
13.	Tools	Object-Action
14.	Transportation	Part-Whole
15.	Animals	Part-Whole
16.	Human Relationships	Expression of
17.	Abstract	Antonyms
18.	Household	Part-Whole
19.	General	Characteristic of
20.	Abstract	Antonyms
21.	Household	Associated with
22.	Transportation	Object-Action
23.	Human Relationships	Object-Action
24.	Human Relationships	Cause Effect
25.	Measurement	Characteristic of
26.	Weather	Characteristic of
27.	Aesthetic	Associated with
28.	Human Relationships	Part-Whole
29.	Animals	Cause-Effect
30.	General	Antonyms
31.	Animals	Characteristic of
32.	Abstract	Antonyms
33.	Human Relationships	Relations
34.	Household	Class-Subclass
35.	Household	Associated with
36.	Weather	Associated with
37.	Household	Class-Subclass
38.	Aesthetic	Object-Action
39.	Animals	Associated with
40.	Geography	Part-Whole
41.	Geography	Associated with
42.	Sports	Associated with
43.	Household	Part-Whole
44.	Human Relationships	Expression of
45.	Household	Part-Whole

Michigan Assessment - Word Relationships - Form UMT Grade 7

	Subject	Relationship
1.	Tools	Part-Whole
2.	Human relations	Characteristic of
3.	Aesthetic	Effect-cause
4.	Transportation.	Related to
5.	Human relations	Associated with
6.	Animals	Characteristic of
7.	Sports.	Associated with
8.	Animals	Subclass-class
9.	General	Related to
10.	Household	Class-subclass
11.	Transportation.	Associated with
12.	Human relations	Antonyms
13.	Transportation.	Subclass-class
14.	Household	Place-action
15.	General	Antonyms
16.	Tools	Associated with
17.	Animals	Class-subclass
18.	Aesthetic	Associated with
19.	Household	Related to
20.	Geography	Characteristic of
21.	Household	Associated with
22.	Household	Whole-part
23.	Household	Part-whole
24.	General	Cause-effect
25.	Human relations	Antonyms
26.	Sports.	Action-place
27.	Human relations	Associated with
28.	Abstract.	Antonyms
29.	Tools	Purpose-object
30.	General	Associated with
31.	Abstract.	Characteristic of
32.	General	Antonyms
33.	Tools	Associated with
34.	Sports.	Associated with
35.	Human relations	Associated with
36.	General	Related to
37.	Weather	Characteristic of
38.	Geography	Place-object
39.	Household	Associated with
40.	Tools	Related to
41.	Tools	Related to
42.	Human relations	Antonyms
43.	Abstracts	Synonyms
44.	Household	Part-whole
45.	Household	Part-part
46.	Household	Part-whole
47.	General	Object-purpose
48.	General	Associated with
49.	Household	Related to
50.	Household	Subclass-class

Michigan Assessment - Reading - Form UMT Grade 4

1. Words - synonym
2. Words - synonym
3. Words - synonym
4. Words - associative
5. Words - illustrative
6. Words - illustrative
7. Words - synonym
8. Words - illustrative
9. Words - synonym
10. Words - illustrative
11. Words - synonym
12. Words - synonym
13. Words - synonym
14. Words - synonym
15. Words - synonym
16. Sentences - inference
17. Sentences - straightforward comprehension
18. Sentences - inference
19. Sentences - straightforward comprehension
20. Sentences - inference
21. Sentences - straightforward comprehension
22. Sentences - inference
23. Sentences - straightforward comprehension
24. Sentences - inference
25. Sentences - straightforward comprehension
26. Sentences - inference
27. Sentences - straightforward comprehension
28. Sentences - inference
29. Sentences - straightforward comprehension
30. Sentences - inference
31. Passage - narrative
    Item classification - factual
    Alternate classification - fact
32. Passage - narrative
    Item classification - factual
    Alternate classification - fact
33. Passage - narrative
    Item classification - interpretive
    Alternate classification - inference
34. Passage - narrative
    Item classification - factual
    Alternate classification - fact
35. Passage - narrative
    Item classification - factual
    Alternate classification - fact
36. Passage - narrative
    Item classification - factual
    Alternate classification - fact

Michigan Assessment - Reading - Form UMT Grade 4 (continued)

37. Passage - social studies
    Item classification - interpretive
    Alternate classification - inference
38. Passage - social studies
    Item classification - factual
    Alternate classification - fact
39. Passage - social studies
    Item classification - factual
    Alternate classification - fact
40. Passage - science
    Item classification - factual
    Alternate classification - fact
41. Passage - science
    Item classification - factual
    Alternate classification - fact
42. Passage - science
    Item classification - interpretive
    Alternate classification - application
43. Passage - narrative
    Item classification - interpretive
    Alternate classification - inference
44. Passage - narrative
    Item classification - factual
    Alternate classification - fact
45. Passage - narrative
    Item classification - interpretive
    Alternate classification - main idea
46. Passage - narrative
    Item classification - interpretive
    Alternate classification - application
47. Passage - science
    Item classification - factual
    Alternate classification - fact
48. Passage - science
    Item classification - interpretive
    Alternate classification - inference
49. Passage - science
    Item classification - interpretive
    Alternate classification - main idea
50. Passage - science
    Item classification - factual
    Alternate classification - fact

Michigan Assessment - Reading - Form UMT Grade 7

1. Words - association
2. Words - synonym
3. Words - synonym
4. Words - synonym
5. Words - synonym
6. Words - illustrative
7. Words - synonym
8. Words - synonym
9. Words - illustrative
10. Words - illustrative
11. Words - illustrative
12. Words - synonym
13. Words - association
14. Words - association
15. Words - synonym
16. Sentences - inference
17. Sentences - straightforward comprehension
18. Sentences - straightforward comprehension
19. Sentences - inference
20. Sentences - straightforward comprehension
21. Sentences - inference
22. Sentences - straightforward comprehension
23. Sentences - inference
24. Sentences - straightforward comprehension
25. Sentences - straightforward comprehension
26. Sentences - straightforward comprehension
27. Sentences - inference
28. Sentences - straightforward comprehension
29. Sentences - inference
30. Sentences - straightforward comprehension
31. Passage - science
    Item classification - factual
    Alternate classification - fact
32. Passage - science
    Item classification - interpretive
    Alternative classification - inference
33. Passage - science
    Item classification - interpretive
    Alternate classification - main idea
34. Passage - narrative
    Item classification - factual
    Alternate classification - fact
35. Passage - narrative
    Item classification - factual
    Alternate classification - fact
36. Passage - narrative
    Item classification - interpretive
    Alternate classification of items in passage - inference

Michigan Assessment - Reading - Form UMT Grade 7 (continued)

37. Passage - social studies
    Item classification - factual
    Alternate classification - fact
38. Passage - social studies
    Item classification - interpretive
    Alternate classification - inference
39. Passage - social studies
    Item classification - interpretive
    Alternate classification - inference
40. Passage - social studies
    Item classification - interpretive
    Alternate classification - main idea
41. Passage - social studies
    Item classification - interpretive
    Alternate classification - main idea
42. Passage - social studies
    Item classification - factual
    Alternate classification - fact
43. Passage - social studies
    Item classification - factual
    Alternate classification - fact
44. Passage - social studies
    Item classification - factual
    Alternate classification - fact
45. Passage - narrative
    Item classification - factual
    Alternate classification - fact
46. Passage - social studies
    Item classification - factual
    Alternate classification - fact
47. Passage - social studies
    Item classification - interpretive
    Alternate classification - inference
48. Passage - science
    Item classification - factual
    Alternate classification - fact
49. Passage - science
    Item classification - factual
    Alternate classification - fact
50. Passage - science
    Item classification - factual
    Alternate classification - fact

Reading Comprehension Test Content Specifications
(1970-71)

		Grade 4	Grade 7
I.	WORDS	15 Items	15 Items
	A. Synonymous (BEGIN: start)	10	8
	B. Associative (DRY: desert)	1	3
	C. Illustrative (RELUCTANT: "I'd really rather not.")	4	4
II.	SENTENCES	15 Items	15 Items
	A. Inference - tests words not in sentence but inferred from sentence	8	6
	B. Straightforward comprehension - tests word in sentence, underlined or boldface	7	9
III.	READING COMPREHENSION		
	A. Items	20 Items	20 Items
	1. Factual (explicit)	14	12
	2. Interpretive (inference)	6	8
	B. Passage Content	6 Passages	6 Passages
	1. Narrative	2	2
	2. Science	2	2
	3. Social Sciences	2	2
	4. Humanities	0	0

Michigan Assessment - English - Form UMT Spelling Grade 4

1. Spelling by sound alone
2. Misunderstanding rules for word formation
3. No error
4. Spelling by sound alone
5. Misunderstanding of rules for word transformation
6. No error
7. Misunderstanding rules for word formation
8. Spelling by sound alone
9. Misunderstanding rules for word formation
10. No error
11. Spelling by sound alone
12. No error
13. Misunderstanding rules for word transformation
14. No error
15. Spelling by sound alone

Effectiveness of Expression - Grade 4

16 - 29. Questions testing effectiveness of expression ask the student to demonstrate his sensitivity to language by selecting the wording which, in addition to being grammatically correct, is best in sentence structure and word order, and is most precise and appropriate in idiom and diction.

Written Usage - Grade 4

30. Verb forms
31. No error
32. Verb forms
33. No error
34. Other (than/as)
35. Adjective forms (a/an)
36. No error
37. Adjective forms
38. Verb forms
39. Subject-verb agreement
40. Pronoun (adj.) - antecedent agreement
41. No error
42. Adjective/adverb confusion
43. Pronoun forms

Punctuation and Capitalization - Grade 4

44. Capital letter - first word of sentence, proper noun; period at end of sentence
45. Apostrophe - possessive, contraction
46. Capital letter - first word of sentence, first person I; comma in date

Punctuation and Capitalization - Grade 4 (Continued)

47. Capital letter - first word of sentence; question mark
48. Comma - direct address; capital letter - proper noun
49. Capital letter - proper noun
50. Apostrophe - contraction
51. Period - abbreviation; comma - address
52. Capital letter - proper noun
53. Capital letter - first word of sentence, proper noun
54. Question mark; capital letter - proper noun
55. Comma - in quotation; quotation marks - direct quote

Michigan Assessment - Mechanics of Written English - Form UMT Grade 7

Spelling

1. Common mispronounciation
2. Spelling by sound alone
3. No error
4. Misunderstanding rules for word formation
5. Misunderstanding rules for word formation
6. Spelling by sound alone
7. Misunderstanding rules for word transformation
8. No error
9. Misunderstanding rules for word formation
10. Misunderstanding rules for word transformation
11. No error
12. Misunderstanding rules for word formation
13. No error
14. Misunderstanding rules for word transformation
15. Spelling by sound alone
16. No error
17. Common mispronounciation
18. Misunderstanding rules for word transformation
19. Misunderstanding rules for word transformation
20. Misunderstanding rules for word formation

Effectiveness of Expression

21 - 40. Questions testing effectiveness of expression ask the student to demonstrate his sensitivity to language by selecting the wording which, in addition to being grammatically correct, is best in sentence structure and word order, and is most precise and appropriate in idiom and diction.

Punctuation and Capitalization

41. Capital letter - proper name
42. Capital letter - proper name; period - abbreviation; unnecessary comma
43. Apostrophe - possessive; capital letter - proper name
44. Capital letter - common/proper noun; comma - in apposition
45. Period - abbreviation; capital letter - proper name
46. Comma - after introductory clause; capital letter - proper noun; colon/comma confusion
47. Comma - in apposition; comma - with conjunction
48. Quotation marks - title; unnecessary comma; captial letter - common/proper noun
49. Comma - in series; captial letter - proper name
50. Apostrophe - in plural form; comma - with conjunction; period - end of sentence

Michigan Assessment - Mechanics of Written English - Form UMT Grade 7

Punctuation and Capitalization (Cont'd.)

51. Comma - in quotation; quotation marks - direct quote; comma in date
52. Apostrophe - in possessive; comma - in compound sentence; capital letter - in proper name
53. Apostrophe - in possessive; capital letter - in personal title; period - in abbreviation
54. Capital letter - common/proper noun; comma - after introductory phrase; apostrophe - in contraction
55. Apostrophe - in possessive; question mark
56. Capital letter - common/proper noun; unnecessary semi-colon; capital letter - proper name
57. Capital letter - common/proper noun; apostrophe - possessive; capital letter - proper name
58. Comma - in date; capital letter - common/proper noun
59. Hyphen - compound adjective; quotation marks - direct quote; capital letter - direct quote; end punctuation
60. Capital letter - proper name; comma - in apposition; period - end of sentence

Mechanics of Written English Test Content Specifications

(1971-72)

		Grade 4	Grade 7
I.	SPELLING	15 Items	20 Items
	A. Misunderstanding of rules for word formation	4	7
	B. Misunderstanding of rules for word transformation	2	5
	C. Reversing of letters	2	1
	D. Common mispronounciation	0	2
	E. Spelling by sound alone	6	5
	F. Other	1	0
II.	EFFECTIVENESS OF EXPRESSION	14 Items	20 Items
	Questions testing effectiveness of expression ask the student to demonstrate his sensitivity to language by selecting the wording which, in addition to being grammatically correct, is best in sentence structure and word order, and is most precise and appropriate in idiom and diction.		
III.	GRAMMAR AND USAGE (Grade 4 Only)	14 Items	
	A. Subject-verb agreement	1	
	B. Verb forms	3	
	C. Adjective/adverb confusion	1	
	D. Adjective forms (including a-an)	2	
	E. Pronoun forms	1	
	F. Pronoun-antecedent agreement	1	
	G. Other	1	
	No error	4	
IV.	PUNCTUATION AND CAPITALIZATION	12 Sentences	20 Sentences
	A. Capital letters		
	1. First word of sentence	4	0
	2. Proper names	6	17
	3. First person "I"	1	0
	4. In personal titles	0	1
	5. In quotations (grade 7 only)	-	1
	B. Period		
	1. End of sentence	1	2
	2. Abbreviation	1	3

Mechanics of Written English Test Content Specifications
(1971-72)

V. PUNCTUATION AND CAPITALIZATION (Cont'd.)	Grade 4	Grade 7
C. Question Mark	2	1
D. Other End Punctuation	0	1
E. Comma		
1. Address, date	2	2
2. Direct address	1	0
3. Series	0	1
4. In quotations	1	1
5. Apposition (grade 7 only)	-	3
6. Compound sentences (grade 7 only)	-	1
7. Unnecessary (grade 7 only)	-	2
8. With exclamation (grade 7 only)	-	
F. Quotation Marks		
1. Title of Short Publication	0	1
2. Direct address, direct quote	1	2
G. Apostrophe		
1. Possessive	1	5
2. Contraction	2	1
H. Colon (grade 7 only)	-	1
I. Semicolon (grade 7 only)	-	1

Michigan Assessment - Mathematics - Form UMT Grade 4

1. Number and Operations - operstions with integers
2. Number and Operations - operations with integers
3. Geometry and Measurement - properties of polygons and the circle
4. Applications - word problems
5. Geometry and Measurement - angles and intuitive ideas of geometry
6. Mathematical Sentences - equations
7. Number and Operations - place value
8. Applications - word problems
9. Number and Operations - special properties of zero and one
10. Geometry and Measurement - units of measure
11. Geometry and Measurement - perimeters and areas of simple polygons
12. Mathematical Sentences - inequalities
13. Number and Operations - place value
14. Number and Operations - estimation
15. Number and Operations - operations with integers
16. Applications - word problems
17. Number and Operations - place value
18. Applications - word problems
19. Relations, Functions, Graphs - use of mathematical formula
20. Number and Operations - operations with integers
21. Geometry and Measurement - scale drawings and maps
22. Mathematical Sentences - equations
23. Number and Operations - operations with integers
24. Number and Operations - operations with integers
25. Logical Thinking - intuitive ideas
26. Applications - word problems
27. Number and Operations - properties of operations
28. Number and Operations - proper fractions
29. Relations, Functions, Graphs - reading and interpreting graphs
30. Number and Operations - properties of integers, divisibility
31. Number and Operations - special properties of zero and one
32. Geometry and Measurement - scale drawings and maps
33. Applications - word problems
34. Number and Operations - proper fractions
35. Number and Operations - proper fractions
36. Number and Operations - properties of operations
37. Applications - word problems
38. Number and Operations - proper fractions
39. Number and Operations - operations with integers
40. Applications - word problems

Michigan Assessment - Mathematics - Form UMT Grade 7

1. Number and Operations - operations with integers
2. Number and Operations - special properties of zero and one
3. Mathematical Sentences - inequalities
4. Geometry and Measurement - scale drawings and maps
5. Number and Operations - properties of operations
6. Number and Operations - operations with integers
7. Number and Operations - proper fractions
8. Mathematical Sentences - equations
9. Applications - word problems
10. Geometry and Measurement - perimeters and areas of simple polygons
11. Relations, Functions, Graphs - use of mathematical formula
12. Number and Operations - place value
13. Number and Operations - operations with integers
14. Number and Operations - properties of operations
15. Geometry and Measurement - units of measure
16. Number and Operations - proper fractions
17. Number and Operations - operations with integers
18. Geometry and Measurement - perimeters and areas of simple polygons
19. Number and Operations - decimals and per cents
20. Number and Operations - proper fractions
21. Relations, Functions, Graphs - reading and interpreting graphs
22. Logical Thinking - intuitive ideas
23. Geometry and Measurement - non-metric geometry
24. Applications - word problems
25. Mathematical Sentences - inequalities
26. Number and Operations - proper fractions
27. Geometry and Measurement - non-metric geometry
28. Mathematical Sentences - equations
29. Geometry and Measurement - units of measure
30. Number and Operations - average
31. Relations, Functions, Graphs - reading and interpreting graphs
32. Relations, Functions, Graphs - reading and interpreting graphs
33. Applications - word problems
34. Geometry and Measurement - units of measure
35. Applications - word problems
36. Applications - word problems
37. Geometry and Measurement - units of measure
38. Number and Operations - estimation
39. Number and Operations - properties of integers, divisibility
40. Geometry and Measurement - perimeters and areas of simple polygons

Mathematics Test Content Specifications

(1971-72)

		Grade 4	Grade 7
I.	NUMBER AND OPERATIONS	20 Items	15 Items
	A. Operations with integers	7	3
	B. Place value	3	1
	C. Properties of integers, divisibility	1	1
	D. Proper fractions	4	4
	E. Decimals and percents	0	1
	F. Properties of operations (commutative, associative, distributive, closure)	2	2
	G. Estimation	1	1
	H. Special properties of zero and one	2	1
	I. Average	0	1
II.	GEOMETRY AND MEASUREMENT	6 Items	10 Items
	A. Units of measure: length, weight, time temperature, money	2	4
	B. Perimeters and areas of simple polygons	1	3
	C. Scale drawings and maps	1	1
	D. Properties of polygons and the circle	1	1
	E. Angles and intuitive ideas of geometry	1	1
III.	RELATIONS, FUNCTIONS, GRAPHS	2 Items	4 Items
	A. Use of mathematical formula	1	1
	B. Reading and interpreting graphs	1	3
IV.	LOGICAL THINKING	1 Item	1 Item
	A. Intuitive ideas: Counterexample reasoning	1	1
V.	MATHEMATICAL SENTENCES	3 Items	4 Items
	A. Equations	2	2
	B. Inequalities	1	2
VI.	APPLICATIONS	8 Items	6 Items
	Word problems (other than those already listed in one of the categories above)	8	6

Note: At least one-third of the problems could be classified as applications.

APPENDIX C

Principal Questionnaire

MICHIGAN EDUCATIONAL ASSESSMENT PROGRAM

Principal's Questionnaire

Name and Title of Person
Completing the Questionnaire _____
Name (Please Print) Title

Name of School _____ School Code _____

Name of District _____

City, State, Zip _____

DIRECTIONS

You are asked to complete this questionnaire as a means of providing information about the home and family background or socio-economic status (SES) of pupils attending your school.

This information in conjunction with last years data and other available information will be used to derive the SES index for 1972.

As you respond to the following questions, you will find some that could be answered with greater confidence if you first summarize the individual pupil records for your building. It is not expected that you will tabulate the data in your individual pupil records before responding. An informed estimate will generally be adequate. But if you are new to the school or not acquainted with the level of the home and family backgrounds of the pupils in your school, it is suggested that the folders of a representative sample of thirty or forty pupils be reviewed as a basis for responding.

PRINCIPAL'S QUESTIONS

1. Estimate the percent of the fathers of your students who

   A. Attended college (whether or not they graduated) . . . . . (____)
   B. Are high school graduates (but did not attend college) . . . . . (____)
   C. Attended high school (but did not graduate). . . . . (____)
   D. Finished 8th grade (but did not attend high school). . . . . (____)
   E. Did not finish 8th grade . . . . . (____)

   PERCENTAGES (A-E) SHOULD TOTAL 100%

2. Estimate the percent of the mothers of your students who

   A. Attended college (whether or not they graduated) . . . . . (____)
   B. Are high school graduates (but did not attend college) . . . . . (____)
   C. Attended high school (but did not graduate). . . . . (____)
   D. Finished 8th grade (but did not attend high school). . . . . (____)
   E. Did not finish 8th grade . . . . . (____)

   PERCENTAGES (A-E) SHOULD TOTAL 100%

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Listed below are six groups of employment types and a seventh group for unemployed or welfare recipients. Please examine the seven groups and select the one group which is descriptive of the employment status of the largest number of parents of children in your school. The word "parent" should be interpreted as the main person in the family who supports the child. In the row of letters below, circle the letter of the group you select. Then, in the space that precedes the word "percent," write the approximate percent of families included in this category.

GROUP	EMPLOYMENT TYPES
A	Workman or Laborer: Such as car washer, fisherman, gardener, gas station attendant, laborer, longshoreman, lumberman, warehouseman. Household Worker in Private Home: Such as cook, housekeeper, maid. Farm Worker: Such as farm foreman, farm laborer, migrant worker.
	*****
B	Operator or "Semiskilled" Worker: Such as apprentice, assembler, bus driver, delivery man, factory machine operator, miner, packer, train conductor, truck driver, weaver, welder. Fireman, Guard, or Policeman: Such as detective, fireman, guard, policeman, sheriff, watchman. Personal Service Worker: Such as barber, bartender, elevator operator, hairdresser, hospital attendant, hotel maid, janitor, restaurant cook, usher, waiter. Farm or Ranch Owner
	*****
C	Draftsman or "Skilled" Worker: Such as baker, boilermaker, bricklayer, carpenter, electrician, engraver, locomotive engineer, mechanic, member of armed forces, plasterer, plumber, printer, roofer, sheet metal worker, stonecutter, tailor, tool and die maker, upholsterer. Foreman: Such as factory foreman, mine foreman.
	*****
D	Office Worker: Such as bank teller, bookkeeper, cashier, dispatcher, messenger, office clerk, secretary, shipping clerk, telephone operator, ticket agent, typist. Salesman: Such as demonstrator, insurance salesman, real estate salesman, sales clerk in store.
	*****
E	Manager or Official: Such as buyer in store, executive in large company, government official, office manager, sales manager, store manager. Business Owner: Such as contractor, restaurant owner, store owner, wholesaler
	*****
F	Technician: Such as dental technician, designer, dietitian, draftsman, medical technician, photographer, radio operator, surveyor. Professional Man: Such as accountant, actor, architect, artist, dentist, doctor, druggist, engineer, lawyer, librarian, minister, musician, nurse, reporter, scientist, social worker, teacher, veterinarian.

GROUP	EMPLOYMENT TYPES
G	Unemployed: Presently out of work, recipients of welfare, etc.

*****

EXAMPLE: If group C is descriptive of the occupation of the largest number of parents providing support, then circle the "C" in the row of letters following the heading "Largest Occupational Group." If you estimate that this accounts for 30% of the families, then in the space that precedes the word "percent", write the figure"30."

3. Largest Occupational Group: (circle one) A B C D E F G

   What percent of parents are included in this largest occupational group?
   _____percent.

- -

Repeat the procedure described above for the second largest group of families. Circle the letter of the group you select in the row labeled "Second Largest Occupational Group." Select an occupational group and estimate the percent of families included.

4. Second Largest Occupational Group: (circle one) A B C D E F G

   What percent of parents are included in this second largest occupational group?
   _____percent.

- -

Repeat the procedure for the third largest group of families.

5. Third Largest Occupational Group: (circle one) A B C D E F G
   _____percent.

- -

PLEASE PLACE A CHECK ON THE LINE IN FRONT OF THE ANSWER YOU SELECT FOR QUESTIONS 6-13.

6. Please estimate the average annual income of the families of pupils attending your school.

__ A. Below $2,000
__ B. Between $2,000 and $3,999
__ C. Between $4,000 and $5,999
__ D. Between $6,000 and $7,999
__ E. Between $8,000 and $9,999
__ F. Between $10,000 and $11,999
__ G. $12,000 or more

7. How would you estimate the average cost of housing in the attendance area of your school?

__ A. Expensive (above $25,000 or equivalent apartment)
__ B. Between medium-priced and expensive ($16,000-$24,999 or equivalent apartment)
__ C. Between low-priced and medium-priced ($9,000-$15,999 or equivalent apartment)
__ D. Low-priced (below $9,000 or equivalent apartment)

8. How would you estimate the average density of occupancy of the housing in the attendance area of your school? (Select one)

__ A. Low-density occupancy (3 or less persons per dwelling)
__ B. Medium-low density occupancy (between 3 and 6 persons per dwelling)
__ C. Medium-high density occupancy (between 6 and 9 persons per dwelling)
__ D. High-density occupancy (more than 9 persons per dwelling)

9. What percent of your pupils live in rehabilitation or slum clearance housing?

___ A. Less than 5%
___ B. Between 5% and 10%
___ C. Between 10% and 20%
___ D. Between 20% and 50%
___ E. More than 50%

10. What percent of the students enrolled in your school at the beginning of the academic year are still enrolled at the end of the academic year? (Do not count students who leave and return during the academic year.)

___ A. Less than 50%
___ B. Between 50% and 80%
___ C. Between 80% and 90%
___ D. Between 90% and 95%
___ E. More than 95%

11. What percent of your pupils are members of family units where one parent is not living in the home? (Do not include students from homes where the father is away on military duty.)

___ A. Less than 5%
___ B. Between 5% and 10%
___ C. Between 10% and 20%
___ D. Between 20% and 50%
___ E. More than 50%

12. What percent of your pupils are from families on AFDC or welfare?

___ A. Less than 5%
___ B. Between 5% and 10%
___ C. Between 10% and 20%
___ D. Between 20% and 50%
___ E. More than 50%

13. Has the average socio-economic status of the pupils attending your school changed since last year?

___ A. Very little or not at all
___ B. Much lower this year
___ C. Slightly lower this year
___ D. Slightly higher this year
___ E. Much higher this year

14. If the average socio-economic status of the pupils attending your school has changed noticably (responses B or E in #13 above) indicate below the reason or reasons you believe it has changed, e.g., extensive bussing, urban renewal, change of school attendance boundaries etc.

_____

_____

_____

_____

_____

APPENDIX D

Participants on the Item Development Committees

READING

Fourth Grade

Dr. Doris Kilanski
Department of Educational Leadership
Eastern Michigan University
Ypsilanti, Michigan

Mr. William F. Estes
Principal
Oscoda Area Schools
Oscoda, Michigan

Ms. Essie-Mae Hansman
Teacher
Utica, Michigan

Mr. Robert Rodgers
Consultant
Oakland Schools
Pontiac, Michigan

Ms. Beverly Chamberlain
President
Michigan Reading Association
Ann Arbor, Michigan

Mr. Kenneth Cogswell
Regional Coordinator, Language Arts and Social Studies
Livonia Public Schools
Livonia, Michigan

Mr. Victor K. Peterson
Superintendent
Shiawassee Intermediate School District
Corruna, Michigan

Seventh Grade

Dr. Michael Homes
Director of Curriculum
Grand Ledge Public Schools
Grand Ledge, Michigan

Mr. John J. Arbour
Principal
Wylie Middle School
Dexter, Michigan

Dr. Laurence Gagnon
Superintendent
Hillsdale Community Schools
Hillsdale, Michigan

Ms. Nancy Seminoff
Reading Specialist
Utica Community Schools
Utica, Michigan

Ms. Jessie Blank
Reading Specialist
Ann Arbor Public Schools
Ann Arbor, Michigan

Mr. Walter Sobczak
Reading Consultant
Southfield Public Schools
Southfield, Michigan

Dr. Sylvia Kinnunen
Professor of Education
Northern Michigan University
Marquette, Michigan

ENGLISH PANEL

Fourth Grade

Ms. Betty Powers
Teacher
Dearborn City Schools
Dearborn, Michigan

Ms. Mabel Jackson
Teacher
Willard Elementary School
Detroit, Michigan

Mr. William W. Powell
Principal
Fowlerville Community
Fowlerville, Michigan

Ms. Dorothy Yancey
Special Teacher
Pontiac City Schools
Pontiac, Michigan

Mr. Ray Chung
Department Chairman
Utica Public Schools
Utica, Michigan

Ms. Alma Petrini
Specialist
Detroit Public Schools
Detroit, Michigan

Mr. Ronald Cruickshank
Teacher
Switzer Elementary School
Utica, Michigan

Seventh Grade

Ms. Maxine Brule
Principal
Washington Elementary School
Coloma Community Schools
Watervliet, Michigan

Ms. Delores Minor
Supervisor, Senior High English
Detroit Public Schools
Detroit, Michigan

Mr. George Weber
Department Chairman
Barnum Junior High School
Birmingham, Michigan

Ms. Pauline Sampson
Department Chairman
Anderson Junior High School
Berkley, Michigan

Ms. Joanne Gilbert
Teacher
Henry Ford Middle School
Highland Park, Michigan

Mr. William Fatka
Principal
Nelson School
Muskegan, Michigan

MATHEMATICS

Fourth Grade

Miss Rita Gronbach
Math Specialist for Grades 4 and 5
Detroit Board of Education
Detroit, Michigan

Mr. Russel J. Huber
Principal
Avalon Elementary School
St. Clair Shores, Michigan

Mrs. Gail Nordmoc
Mathematics Demonstration Teacher
Region 2
Detroit, Michigan

Mr. Arthur Behrmann
Principal
Hartland Consolidated Schools
Hartland, Michigan

Mrs. Annette Vogelsand
5th Grade Teacher
Forest Hills Board of Education
Grand Rapids, Michigan

Mr. Thomas McMillan
Research Center Teacher
George Roberts Elementary School
Sterling Heights, Michigan

Mrs. Mary Jane Franklin
Elementary Teacher (all subjects)
Wyoming Board of Education
Wyoming, Michigan

Seventh Grade

Mr. Terrence Coburn
Math Consultant
Oakland Schools K-12
Pontiac, Michigan

Miss Dorothy McAnulty
Teacher
Mary Lyon Junior High
Beulah, Michigan

Mr. Richard Knobloch
Teacher
Eisenhower High School
Romeo, Michigan

Mr. Thaddeus Lau
President, Greater Flint CTM
Flint, Michigan

Mr. Dave Thomas
Mathematics Department Chairman
Brownell Middle School
Grosse Point Woods, Michigan

Mr. Leigh Beagle
Principal
Hasleh Middle School
Okemos, Michigan

Mr. William Schewe
Department Chairman
MacDonald Middle School
Lansing, Michigan